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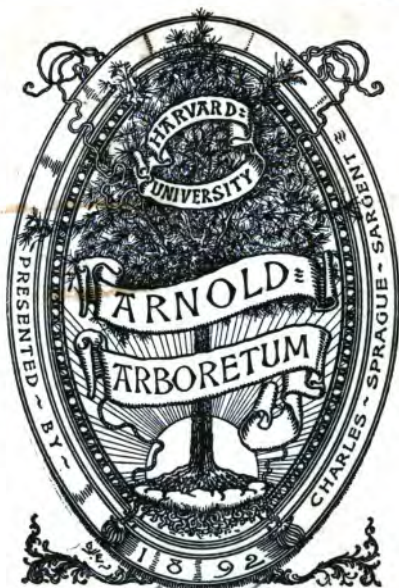
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REPORT OF THE COMMITTEE ON THE RELATION OF FORESTRY TO THE PUBLIC HEALTH.

By PROF. WILLIAM H. BREWER, CHAIRMAN,
Yale University, New Haven, Conn.

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REPORT OF THE COMMITTEE ON THE RELATION OF FORESTRY TO THE PUBLIC HEALTH.

BY PROF. WILLIAM H. BREWER, CHAIRMAN,
YALE UNIVERSITY, NEW HAVEN, CONN.

That forests are intimately related to the public health is so universally conceded that the fact needs no argument here.

Exact investigations on the subject are curiously few, and the committee is not aware that any systematic presentation of the whole subject has yet been made, in the light thrown upon it by scientific research. Ebermayer of Munich has discussed portions of the subject from original research as well as compilation in his "*Hygienische Bedeutung des Waldes*," Vienna, 1890, but his paper does not touch at all on some of the points of greatest interest to us, and moreover, both the conditions and the problems involved are very different in Europe from what they are in America. The committee therefore wishes to present a statement of the chief points of interest as they now are in the portion of North America we represent, to the end that this Association, both by the individual zeal of its members and possibly by its action as a whole, may aid in extending our specific knowledge of the subject, and in promoting this factor in practical sanitation.

In this report the committee confines itself to forests and forestry in the countries represented by this Association, namely, Mexico, the United States and Canada. This geographic region is so vast in extent, it includes such a variety of climate, soil and topography, that the relations of forests and forestry to the public health are very unlike in different portions of it. Some of the questions involved are local and others general, but for our present purpose these several relations may be classified into two main divisions or classes, namely, the relations of forests to the health of communities as communities, and the relations of forests to the health of individuals as individuals.

A community dependent on a forested watershed for its water supply is an illustration of the first, and the people most concerned may be distant from the district on which the rains fall. In this case the forest benefit comes to the community specially benefited. An individual may visit a forest for recuperation or cure, or he may choose his dwelling near it for its more salubrious air, or a similar place be chosen as a site for hospitals and sanatoria for the same reasons. These are illustrations of the second, and in these cases the individual must go to the forest to be directly benefited by it.

The immediate subject presented to this committee is "The Relation of *Forestry* to the Public Health." We assume that this includes a consideration of what the relations really are of the forests themselves to health.

Forestry is the art which concerns itself with the care, the maintenance, the economical utilization and the preservation of forests; how forests may be protected in their life and existence, how promoted as to their luxuriance of growth, how the crops of wood or other products may be harvested to the best profit, and at the same time the forests themselves be preserved for permanent use. Heretofore the rule in this country has too often been to destroy the forest by the using of it. In this report we will use the word "forest" in the sense of woodland, a tract of land with its permanent covering of trees or shrubs.

In the public mind, forestry is widely misunderstood. It is too often looked upon as if it was strictly analogous to agriculture, and as if it were a branch of that industry.

In this discussion we consider it especially important that the differences be kept in mind that we may the clearer see how to direct our efforts that they may do the most good. Agriculture, our other great rural interest, began with the settlement of the country and all of us are therefore more or less familiar with its principles and methods. Forestry in its best sense is new to us and probably this is the reason why so many misunderstand both its principles and methods.

In some respects these two arts are very like, in others very unlike, even when interdependent. Forestry like agriculture is an art, and in both, we must apply the knowledge gained from the sciences if we wish for the highest practical success. Hence either subject may be studied as a science by those not practicing the art. There is a science of forestry which the members of this Association may study with profit.

The art of forestry is like the art of agriculture, in that it may be successfully practiced by the small landholder. It is very unlike agriculture, in that it is of more general importance to the country at large, and especially of much greater importance to the public health, when it is conducted on a large scale and on great continuous tracts of public land owned by the municipality, the state or the nation, and its management conducted as a branch of the public service. This fact is so very important when we consider the relations of forestry to the public health, that the stronger to emphasize it, I will consider the subject more fully.

Agriculture is solely concerned in the production of cultivated crops and of domestic animals. Its problems are entirely local. As a rule its most successful practice is by private land owners on holdings of

moderate size. Moreover, its methods and its products may be changed from year to year. It may be suddenly abandoned at any place, should circumstances demand it, and almost as suddenly be resumed when the circumstances are again favorable. Contiguous farms may be successfully conducted along very unlike lines, growing different products, and by different methods. But forests must be more permanent. Trees are the longest lived of living things, and require the longest time of any crop to grow. The very idea of a forest is associated with permanence, and its most important use may be not at all local. An obvious phase of this fact is seen in the relation of forests to the conservation of water for the supply of distant cities or for the navigation of distant rivers. Its greatest relations to the public welfare are not local. In our own country, they are wider than the states themselves, and in places become matters of such geographic extent that only the nation can successfully handle them. New York City should own and manage the forested watershed of Croton river, the main source of its water; New York State, its Adirondack forests for the maintenance of its navigable canals and rivers; and the nation, certain of its great western forests where the interests of two or more states are often involved.

The physical factors involved in the relation of forests to health are Forest Water, Forest Soil, Forest Air and Forest Climate. These cannot be fully discussed as independent factors, because all are closely correlated, and more or less interdependent, and moreover, they all work in combination in most of their hygienic relations.

Forests rarely occur where the annual rainfall is less than ten inches, and a considerable more than this is required for a luxuriant growth. But, if the climate is warm enough, no rainfall is great enough to prevent forest growth. Localities in India have luxuriant forests where the greatest recorded rainfall in the world occurs, 600 inches per year being common, and over 800 inches have been recorded in exceptionally rainy years.

Forest Water. The chief relations of forests to water, are, firstly, that forests conserve the rainfall. This is perhaps its most important relation to the public health in the countries here under consideration. Secondly, forest waters, as a rule are purer than the waters of the open country. These are the greater relations. It is probable, however, that forests slightly increase the rainfall, but if so, the relative amount is not enough larger to be an important factor.

Forest waters are *purer* than those from tilled lands. The dissolved impurities of natural water are derived from the decaying organic matter on or near the surface, and from the solution of certain portions of mineral matter from the soil. It is obvious that the organic impuri-

ties would be more abundant in waters flowing from cultivated fields. Forest soils are so little disturbed that the constituents change less rapidly than in tilled soils, where the stirring, mixing, and manuring promote chemical changes in the mineral matter which increases its solubility.

Forest waters are also, as a rule, *clearer and cleaner*. They contain less suspended matter which produce turbidity and also much less bacterial life. The hygienic importance of these characters are obvious.

Forests, always and everywhere, conserve the rainfall and regulate the flow of springs and streams better than the open country does. The practical applications of this fact will increase in hygienic importance with the increase in size of our cities and in the number of towns requiring a public supply of water. The economic importance, as related to agriculture, we will not discuss here, although its intimate relation to the food supply of many of our states, makes it indirectly an important hygienic factor.

Forest streams always have a steadier flow than those from an open country. The floods are restrained and are neither so sudden nor so violent, the high water is more prolonged in its decline and in times of drought the streams do not become so low. Therefore they make the surplus rainfall more available for the use of mankind and the welfare of his crops and his animals. We need not here enter into the well-known elementary details of the process. It is enough for us to say that it is a law of nature that a covering of living plants, clothing the ground, preserves the soil from washing away from the hillsides and regulates the flow of springs and streams. Whether the green mantle be a forest of trees, a chaparral of shrubs, or a turf of grass, it performs this all important office. In each case, the vegetation preserves the soil and conserves the waters falling upon it. The leaves and stems of the plants hinder the rain and snow from running off or flowing off, the roots bind the soil and keep it in place and by their decay impart to it a texture and condition which promotes the absorption of the water into its substance, and the shade retards evaporation. This is the great function of the mantle of verdure with which nature beautifies the landscape and protects the hills in its folds and the valleys in its creases.

Turf, chaparral and forest differ in the degree and magnitude of their work, but each, according to its nature and its opportunity, performs this same beneficent function. The precious water is prudently saved in times of abundance and charitably given out in times of drouth and thirst.

Chaparral. In climates so dry or so uncertain that the woody growth is stunted or reduced to chaparral, the function of water con-

servation is reduced, but not obliterated. Chaparral preserves the soil from being washed away, and in that way serves in saving the water.

In a region having a scanty rainfall, the amount varying greatly in different years, and with the watershed entirely or in part covered with grassy slopes, which become very dry every summer, and yet might be induced to grow small trees, the relations of trees to water conservation are less understood.

Whether increasing the tree growth on such a watershed would so increase the waters in exceptionally dry years, that the available amount would be greater, is as yet an unsolved problem. We are left entirely to conjecture. Certain European investigators have learned that the transpiration of moisture from the leaves of the trees would more than offset the saving due to the shading of the ground and the better retention of the water in the soil. The National Academy Forest Commission of 1896 had this problem presented to it, but could make no satisfactory answer. Specific investigation and exact data are lacking, but it is an important problem for some of the cities of California and those other western regions where there is a great range of yearly rainfall, and sometimes periods of several dry years in succession.

The height of the ground water, and the moisture of the upper layers of the soil, are hygienic factors, so important and varied that they have been overrated by many sanitarians, notably by the eminent Professor Pettenkofer. Space forbids a full discussion of this complicated subject in its forest relations. It may, however, be stated as a general fact, that the average level of the ground water is greater in forests than in the open country, its fluctuations are less and that this is a matter closely related to the public health, especially in country districts depending on wells for water.

Wet soils have in some places been made much drier and healthier by being planted with trees, especially with certain species of *Eucalyptus*. The kinds used are of rapid growth, and transpire so much water that the soils are made drier. It is, however, possible that with trees of this genus, the aromatic exhalations of the trees may be a factor in producing the hygienic results reported to have been achieved. Their planting and growth has reduced malaria in various parts of the world. In Cuba they are reputed to drive away mosquitoes, but in Mexico this is denied.

Forest soils differ from the soils of fields and treeless regions in several characters. There has been much investigation of this subject, in the interest of both agriculture and forestry. For our present purpose, it is enough to say that forest soil, not being stirred except as is done by the roots of plants, it is not subject to that rapidity of chemical

change that occurs in lands subjected to tillage, by which fresh portions are successively brought to the immediate action of the air. Forest soils are very much poorer in bacterial life as to quantity, and unlike as to prevailing species. They are usually protected by a covering of leaves in various stages of decay and the organic matter in the soil itself is relatively much more concentrated in the uppermost layer. In cold climates it does not freeze so deeply in winter nor get so warm in summer, nor is it subject to as great daily fluctuations of surface temperature as occurs on open ground. These affect the chemical changes that go on in the soil and on its surface, and all taken together have some hygienic influence. Precisely how much, or in what way is not specifically shown, and are matters of speculation and inference rather than of demonstration or proof. (See, for forest soils, "*Forschungen auf dem Gebiete der Agriculturphysic*, Vol. IX, part 3d.)

Forest Air. Important as the relation of the air is to health much greater importance was formerly attached to it than now. It was once considered to be the chief vehicle for the spread of many epidemics and pestilences, and was often believed to be the immediate cause of them. Many terms in medicine are survivals of these old beliefs, of which "malaria" is perhaps the most familiar. There is a large literature relating to this, curious to the modern student of science. With the growth of exact knowledge, the relations are known to be no less real, although not so startling.

Forest air has been much talked about and written about. That many invalids are improved by it, there is no question; so are invalids often benefited by sea air and mountain air, which in many characteristics it resembles. That forest air is usually salubrious, and often even curative, is well known. There have been some considerable specific and exact investigations made as to its actual peculiarities, some of the investigations being incident to general investigations on the atmosphere respecting its composition and contents, and others directed especially to this end in forestry experiment stations in several European countries. Many thousands of chemical analyses have been made showing very particularly the relative properties of oxygen, carbonic acid and ozone, and there have been numerous investigations on the amount of dust and bacteria.

Chemical Composition. When it became known that green, living plants decompose carbonic acid and liberate free oxygen, this was quickly assumed to be a prominent cause of the beneficial effects of forest air. It seemed plain that the air must be purer in the sense that it was richer in the life-giving free oxygen and poorer in the poisonous carbonic acid. It is an error, however, to make this the chief or

even an especially important hygienic factor. Actual analysis shows that this difference is too small and too uncertain to be a factor of any considerable importance. A sufficiently larger proportion of oxygen is not a special characteristic of forest air. (See Ebermayer—*Die Beschaffenheit der Waldluft*, Stuttgart, 1885.)

Ozone. Of more interest is the relative amount of ozone. While the direct effect of this was greatly overrated a few years ago, it is sufficiently well established that ozone has often a curative value, and it is also abundantly proven that forest air, and more particularly the air on the edges of forests, has a larger average ozone-content than the air over cultivated fields and towns. Indeed the air of cities is always relatively poor in ozone and within crowded dwellings it is usually entirely lacking.

There is a large amount of recorded observation on the relative amounts of ozone and its atmospheric distribution. The average is richer in forests than in regions distant from them, and richer on the edges and above the crown than within the forest itself, particularly of a deciduous forest. It is, as a rule, more abundant in *coniferous* forests, pine, spruce, fir, balsam, cedar and the like. This is doubtless due to the balsamic and terebinthine exhalations of many cone-bearing species.

The specific therapeutic effects of ozone need not be here discussed, farther than to call attention to the experiments of Professor Binz of Bonn on ozonized air promoting sleep, and of Dr. Blankenburgh in the Hartz, who experimented with it for many years and its especially beneficial results upon chronic nervous diseases. It is eminently probable that ozone is a factor in the restful and sleep-promoting influence of forest air, so often observed by physicians in their practice, and by laymen who visit the woods for rest and recuperation.

Then, too, ozone by its oxydizing power is a great destroyer of the gases produced by putrefactive decay and which are always unwholesome. This is perhaps the chief reason why there is less ozone in cities, and over-cultivated fields. It is there used up in the act of its destroying such gases. It is also probable that this is why ozone is more abundant over the crown of foliage of a forest, and in its immediate neighborhood, than it is within the forest itself, where it is partly used up in destroying the gases rising from the organic matter decaying on the forest floor. While the direct therapeutic action of ozone was doubtless formerly overrated, it is eminently probable that by its indirect influence on curative processes it is very important as a factor increasing the salubrity of forest air.

Marsh gas (Methane) is produced by the fermentation of cellulose under water. It has long been known that it was generated in forest

swamps and is believed to be pernicious to health. Its removal from the atmosphere has heretofore been attributed to the oxygizing action of ozone. Urbain has recently shown that ozone attacks it but slightly, and that it is destroyed by the action of living plants, and if this be true (as seems now proven), it would explain, in part at least, why forest swamps should become more insalubrious, for a time at least, after the trees have been destroyed than it was before. This is a common belief in the regions west of the Appalachian's and north of the Ohio. It is interesting to find, as Urbain's investigations seem to show, that the accumulation of unwholesome hydrocarbons as well as poisonous carbon dioxide (carbonic acid) are prevented by the action of the living forest foliage.

Dust. The dust in the air constitutes a much more important ingredient. That forest air is cleaner than that of the city or country is evident to the senses. Modern scientific investigations strongly confirm this and show that there is an enormous difference in the dust-content of forest air from that over an open and occupied country, both in respect to quantity and quality. Dust is always and everywhere a constituent of the air and the role it plays in the various atmospheric phenomena has been the subject of a large amount of investigation during the last thirty years, and especially since 1880, when Professor Aitkin of Edinburgh announced its relation to the condensation of watery vapor. Methods have been devised for counting the number of dust-particles in a given volume of air and numerous countings have been published. As might be expected, they are enormously more abundant in the air of cities and over-cultivated fields. The dust from the streets and roads, and from the fields and gardens, the dust produced by many operations in the industries, the smoke particles from the numerous chimneys, and the thousand and one other sources of dust, make the local differences very striking and they have been extensively studied. The amount and the unwholesomeness of this dust is intimately related to the density of the human population. The most harmful ingredients are decaying organic matter and the micro-organisms small enough to be raised by the wind, and especially the pathogenic bacteria.

When we consider that the air drawn into the lungs amounts to twenty or thirty pounds daily, containing an aggregate of very many millions of dust particles, and that much of this adheres to the moist surfaces within the lungs, we need not wonder that an excess of dust of any kind becomes harmful, and as the air of the forest is cleaner than the air of populous regions it must be more salubrious in this respect. I have for many years made a study of dust in its relations to various other atmospheric phenomena, and believe that its relative scarcity in

forest air is the most important hygienic difference between that and city air.

Bacteria constitute the most harmful ingredient in atmospheric dust. There have been very many investigations on the bacterial contents of the atmosphere, both as to kind and abundance. We have already stated that forest soil and water are both very much poorer in bacteria than that from cultivated fields, and the forest surface is such that those which are produced are not easily liberated into the air. Moreover, the winds are never so high, therefore the bacteria that are wafted there from outside sources fall sooner than they would if over the open country. The filtering action of the foliage is a factor in diminishing the suspended dust, as is easily seen on the dust-laden leaves in thickets by the roadside.

As an illustration of how rapidly bacteria diminish among trees, we may use Miquel's investigation. He carried on a series of comparative observations on the bacteria in the air in the central part of Paris and in the Park of Montsouris for five years, 1881 to 1885. The average number for that period was 3910 per cubic meter of air in the heart of the city and 455 in the park in the suburbs. Montsouris is a small park of about forty acres lying only two and a half miles south of the old and crowded part of the city. It is actually within the encircling fortifications of the city, yet the bacteria averaged only about one-tenth as numerous as in the air in the city streets. This, remember, was the average. The extremes were vastly greater, particularly in summer.

It is not safe, however, to push these comparative conditions as to trees too far. We may have treeless regions, if uncultivated, with even fewer bacteria in the air than is usual in forests.

Dryness, sunshine and freely circulating air are the great destroyers of bacterial life. Hence, an open, treeless country may be a very healthful place, if the conditions of climate and soil are also favorable. The air there is sometimes almost free from bacteria. There are regions in California, and indeed many places west of the one hundredth meridian, where the air is almost sterile. But in a populous region with abundant rains and cultivated gardens and fields, the forest air is always purer than other country air as respects bacteria.

Forest climate differs from that of the open country in several particulars, and this has been the subject of much study in several countries of Europe. Many series of observations have been carried on at forest experiment stations and other meteorological observatories. As an illustration, see Ebermeyer's "*Die Physikalischen Einwirkungen des Waldes auf Luft und Boden und seine Klimatologische und Hygienische*

Bedeutung," Berlin, 1873; founded on observations made mostly in Bavaria, specially directed to this end.

Forest climate somewhat resembles a sea climate in that it is a little purer as to gaseous impurities and is very much cleaner of dust, and is also of more uniform temperature. It differs widely from sea air in its milder winds and in those ingredients and odors which come from the trees themselves. Its gentler winds are probably its most important climatic character, as related to health, and the next in importance is its more uniform temperature.

Harsh and raw winds are tempered by trees, and so important is this and so well known that, in our own country, when a new open prairie is settled, trees are immediately planted to make a "wind break," for its protection to the health of the family as well as for the health and shelter of garden and orchard. The temperature in a forest is a little lower and is very much more uniform than that outside, not so hot in the hottest weather, nor so cold in the coldest weather, the daily, monthly and yearly range is decidedly less. The days are cooler and the nights warmer. The bleak winds of winter are less chilling and the hot winds of summer neither so dry nor so scorching. There is also less range in humidity, the air never becoming so very dry in woodlands as in the open fields in times of drouth nor in the midday heat. The differences in the temperatures of the soil are even more marked, and have been carefully studied by long series of observations made at the surface, and depths of one, two, three and four feet. The ground does not freeze so deeply, the daily, monthly and yearly range of temperatures are less and changes are neither so sudden nor so great.

The hygienic aspects of these several characters are especially obvious in their effects on the young, and feeble, the invalid and the aged. The combination of special characteristics of the soil, water, air and climate furnish a philosophical reason for the location of sanatoria and hospitals in forests or on their edges.

The psychological influences of forests are especially beneficial to very many persons. This is probably a relatively new hygienic factor, due to the absorbing sentimental love of nature which, to the present generation, endows forests with such a charm. This is a very modern sentiment. The ancients had none of it, nor did it exist in mediæval times. "This mysterious analogy between the human emotions and the phenomena of the world without us," as Humboldt expresses the sentiment which colors the poetry and literature of today and is so healthful in its influences, is entirely modern. To the ancients and mediævals as well, both mountains and forests were places to be shunned. They were held in fear as well as awe. The mountains

were the abodes of dragons and the dark forests were the homes of evil spirits.

As Europe emerged from mediævalism, the poets first, began to see beauties in mountains and forests and write or faintly sing about them. Later, scarcely more than a century ago, as the natural sciences began to expand, particularly geology and botany, the mountains and the forests became places of peculiar interest to students of nature, and were visited for scientific study. What we study we come to love. Science drove the dragons and demons away and led the learned and unlearned alike to admire and love the grand and sublime in nature. Now the mountains and forests have become the playgrounds of the people of our civilization, and what a gain this is to the world! To contemplate forests, and particularly mountain forests as moderns do, with mingled love and ecstasy as well as awe, has a soothing and healing influence of itself, and is often the best of medicines.

Neither in classical literature nor in the Bible, nor in the Koran, nor in the literature of the middle ages is there any evidence that the people loved forests or took pleasure in them or visited them for æsthetic gratification. I have looked carefully but in vain for evidence of any such popular sentiment. The authors wrote as if they purposely avoided saying more than was necessary about a disagreeable subject. Even in the works of Herodotus, that most eminent of ancient travelers and geographers, one finds absolutely nothing about forests. He tells about the rivers, and the mountains, and the deserts, and the fruit trees and the animals of the various countries of the known world, but he never so much as alluded to forests, other than in a very few of his descriptions, as of Ethiopia for example, he states merely that there is an abundance of trees.

I enlarge on this fact because I believe that this new sentiment, born of science and now stimulating our intellectual life and shaping our æsthetic pleasures, has a profound hygienic importance which will continue to grow with the development of our culture, that it is susceptible of varied application and that it is well for this Association to encourage this healthy sentiment and study its hygienic uses. I consider it important to the countries covered by this report. The forests of North America are preëminent among the forests of the world. They are preëminent for their richness in variety of species of trees, for the beauty and majesty of the trees themselves, for the sublimity and extent of the forests, and for their impressiveness on imaginations and emotions of men.

Forests may, however, be too rank for any but the healthy and the rugged. Tropical forests, if in rainy countries, are not resorted to for strengthening the feeble or healing the sick. No early civilization or

even advanced barbarism has ever sprung up in a forest-clad country. Assyria, Egypt, the whole Mediterranean region, Mexico, Peru, wherever an early civilization began, however unlike in climate, topography, productions, and facilities for commerce, the regions were all alike in this, that there was much open or treeless country, with trees sufficiently accessible for the uses of civilization, but land open for cultivation. When Roman law and culture was carried from the drier Mediterranean region over the Alps and into the wetter and forested regions north, as the civilizing of a new people went on, new sanitary problems were presented to the Caucasian race. There is no more interesting chapter in the history of the fifteen hundred years, from the third to the eighteenth centuries, than that of the new sanitary problems thus introduced. Here in America the case was different. It was a migration of civilized people who carried their civilization with them. It was colonization, not conquest. Agriculture feeds civilization. Therefore, when a civilized people attempt to colonize and occupy a forest-clad country the first work is to conquer the forest and subdue the soil to tillage. The battle with the forests is then always a hard one. The early European colonists to this country, everywhere north of the gulf, were confronted by this foe to progress. The battle was a long as well as a hard one. It was nearly two hundred years before the reluctant forests retreated more than a few miles from the navigable waters. It was a war of extermination. Even where the wood and timber were cut for use, it was usually a work of devastation, with little care, often none whatever for the preservation of the forests for future use.

It was not until the destruction had gone too far that there has been a popular awakening to the dangers involved. After nearly three centuries of education in the destruction of forests, it takes time to educate the people and create a strong sentiment for the salvation of the forests that are left. Much land, unsuitable for agriculture but eminently useful for forests, has been made desolate which should be reforested. To help create such a sentiment should become one of the functions of this Association.

The wider the scope of any subject, the more indefinite its limits and boundaries. Forestry passes insensibly into the management of parks, landscape gardening, horticulture, the artificial production of trees for medicinal and commercial products, shade trees for country and city, and so on.

Parks and Forest Reservations. The original idea of both forests and parks were reservations for pleasure grounds, as distinct from lands for mere economic use. Forests were open, parks were enclosed. According to the first legal definition (Manwood, "*A Treatise and*

Discourse of the Lawes of the Forest," London, 1598), "A Forrest is a certen Territorie of Woody grounds & Fruitful pastures, privileged for wild beasts and foules of Forrest, Chase, and Warren to rest and abide in, in the safe protection of the King, for his princely delight and pleasure, * * * to the end that the same may the better be preserved and kept for a place of recreation and pastime, meete for the royall dignitie of a Prince." Bladdiston, two hundred years later (in his large and authoritative work (*"The British Sportsman; or Nobleman, Gentleman and Farmer's Dictionary of Recreation and Amusement,"* London, 1792), entirely confirms this. He quotes Manwood as to what a forest is and adds that "Parks and Warrens are places where deers, hares, rabbits and other game are enclosed for the purpose of increasing them and having a ready supply at all times, either for the table or for the chase." These English laws did not differ essentially from those of the other countries of Western Europe, in that it was the use of woodlands for pleasure and recreation, reserved for royalty and the privileged classes. In Europe it remains so to this day, although now some of the privileges have become more public.

I need not discuss here the wisdom of our national government, and of several states and municipalities in establishing parks as pleasure grounds for public use. It is in accordance with our extension of privileges to all citizens alike. No further argument is needed as to the relation of such reservations to the public health. In fact, that is usually now urged as one great and often the chief reason for their establishment. Even in city parks, a leading aim of the landscape gardener who plans them, is to imitate in them so nearly as is possible certain conditions and aspects which are natural to forests, to impart to them those forest characters which makes the contemplation and use of them so restful, healthful and soothing, a relief to nerves which have become tired with city noises and the distractions and irritations incident to city life. In our country, we can draw no sharp sanitary line between forests and parks. It is a continuous grade from the small city park to Yellowstone Park, and from the great Yellowstone to the greatest Olympic forest reservation.

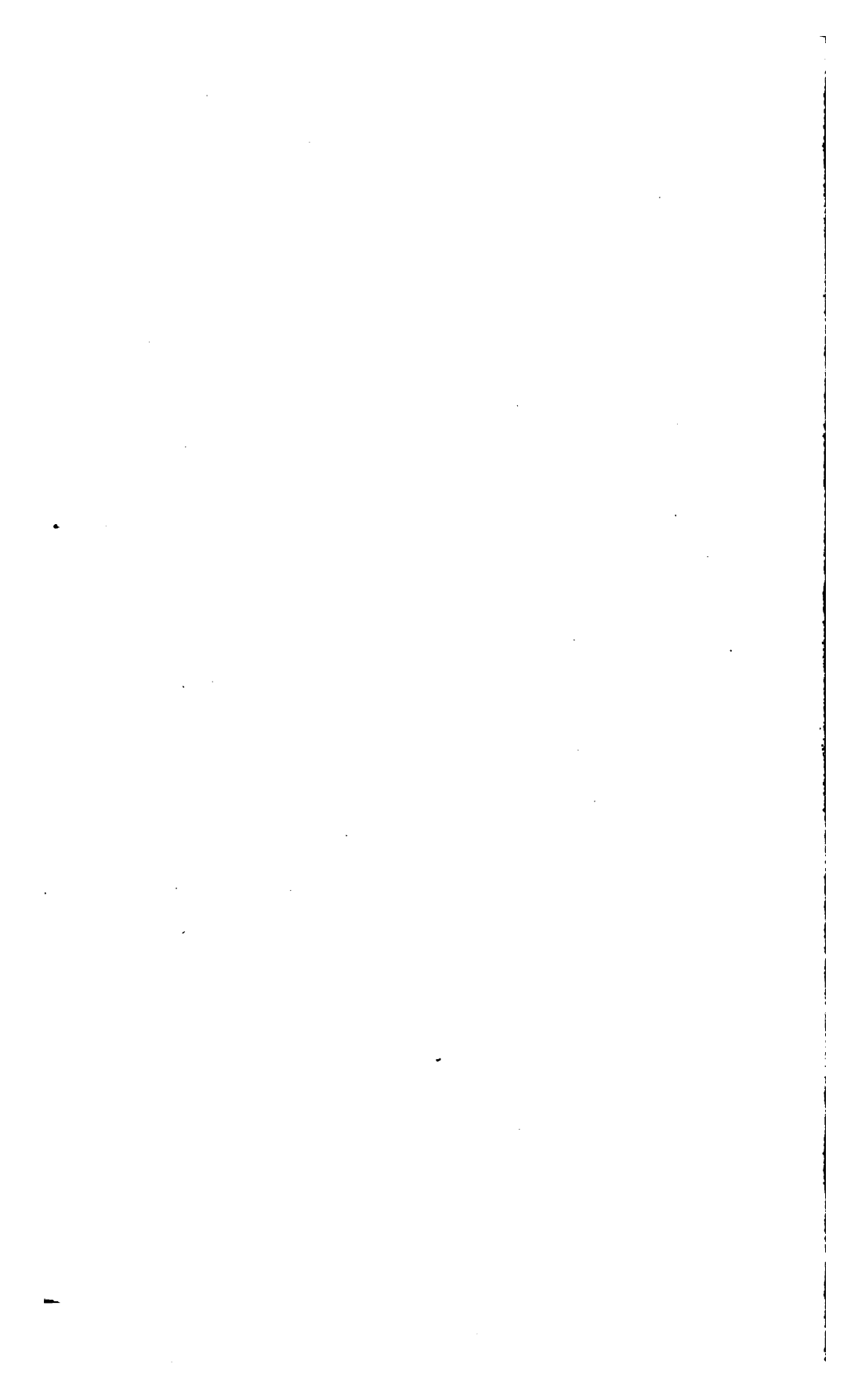
Shade Trees. The subject of shade trees only needs mention here further than to say that their influence is in many ways healthful, psychologically and physically; also that they may be too abundant near the immediate dwelling, in that they increase dampness, especially in certain climates, and may too much obstruct the sunlight. I have known several families to suffer from consumption, where I have no doubt whatever that the disease was invited and intensified by the dense shade of the beautiful and beloved trees about the old homes. In this matter the choice of the species of trees to use has been too lit-

tle considered from the hygienic point of view. The open habit of the American elm is better for many places than the dense and darkening habit of the sugar maple. I have, for a number of years, carried on a series of observations on this matter in New Haven, Conn. The "City of Elms" has also many sugar maples in its streets and its climate is very humid, especially so in the dog days. The streets dry quicker under the elms than under the maples, even when growing near each other on the same streets, and the houses are less darkened when placed near elms than maples. The difference in the density of the shade is very marked. Other species might be cited to illustrate the same fact and point the advice to select the species for its special place. Nature does that and she succeeds.

The medicinal products of forests, and their relations to forestry. Quinine is a notable illustration. When the natural cinchona supply became scarce in South America, the European governments having tropical colonies, especially the English in India and the Dutch in Java, began its cultivation, founding its artificial production on careful scientific investigations. You know the result. Cultivated plantations now supply most of the quinine of commerce. Now that this country has extended its possessions into the tropics, this may yet become a live question with us. There are other forest medicinal products of our American trees and shrubs, some of wide popular use, of which witch hazel is a familiar example. Whether the cultivation of trees for this use will ever be of much importance in this country and Canada cannot now be stated; it is, however, worth mentioning, and in Mexico will undoubtedly become an important matter.

In conclusion, we may say that the "Relations of Forestry to the Public Health" on this continent are so many and so great that boards of health should give their official attention to the matter whenever practicable, and in such ways as the local conditions suggest. Several of the state boards have already taken an active part in the promotion of forestry, and in the protection and salvation of existing forests, but most of them have done nothing officially in this line, although many of the individual members of state and provincial boards have unofficially done much as individuals and as public spirited citizens. The local conditions are so unlike that no short rules of practice can yet be formulated for adoption everywhere. The problems in Connecticut and California, in Mexico and Canada, in Nebraska and Oregon are so very unlike, that action in each state or province must be planned to suit the local conditions. But we believe that the American Public Health Association can be a powerful factor in advancing the good work, by taking an active interest in the general subject, educating the public as to its hygienic importance, aiding in the establishment

of forest reservations under public management, municipal, state and national, and urging that the practical management of our public parks and forests be by experts, educated in the science and trained in the art of forestry. We would recommend the public ownership of such lands as are worth more for public forests than for agriculture, to be administered as a branch of the public service, in the interest of the public health as well as for the economic welfare of the people.









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